VOLUME 28 · NO 2 · NOVEMBER 2020

# PAST GLOBAL CHANGES

MAGAZINE

# CLIMATE RECONSTRUCTION AND IMPACTS FROM THE ARCHIVES OF SOCIETIES

**EDITORS**

Chantal Camenisch, Sam White, Qing Pei, Heli Huhtamaa and Sarah Eggleston

PAGES

futureearth

Research. Innovation. Sustainability.

doi.org/10.22498/pages.28.2.38

# Historical climatology in Western and Northern Europe: State-of-the-art, typical documentary data and methods

Chantal Camenisch[1], H. Huhtamaa[1], N. Maughan[2] and C. Rohr[1]

**Recent studies reconstructing past climates in Northern and Western Europe have employed innovative uses of natural archives and documentary data. Documentary climate proxies include plant and ice phenological data, weather-related descriptions in chronicles, newspapers, and administrative records, as well as early weather diaries and instrumental records.**

Modern historical climatology as a scientific discipline has its beginnings in Western and Northern Europe. Pioneering reconstructions by Hubert H. Lamb, Emmanuel Le Roy Ladurie, and a generation later by Pierre Alexandre, Astrid Ogilvie, and Andres Tarand, focus on these regions. In the following decades, scientists have continued to be productive in studying and analyzing past climate in this part of the world. Here, we discuss the most recent climate reconstructions (since 2014) from the field of historical climatology, together with a brief overview of the most commonly used sources and methods.

**France**

Among the most recent reconstructions of the climate of France or parts of modern France, the work of Laurent Litzenburger (2015) deserves special mention. Litzenburger reconstructed seasonal temperature and precipitation indices for the Lorraine region as well as several extreme weather events and their impacts on society from 1400 to 1530. For this purpose, Litzenburger examined a large corpus of historical documents such as narrative sources with weather descriptions, but also plant-phenological proxies. Thomas Labbé et al. (2019) published another important summer temperature reconstruction based on grapevine phenology in Beaune from 1354 to 2018. The authors used a series of data covering 664 years to determine the beginning of the grape harvest using wage payments, newspapers, and the deliberations of a church chapter and the city council (picture of medieval grape harvest, Fig. 1). The grape harvest dates were homogenized and then calibrated and verified with a long series of early instrumental measurements from Paris. Pichard and Roucaute (2014) published a history of hydrology and flooding in the Rhone valley over the last 700 years.

Several specific extreme weather conditions and weather-related disasters have attracted attention in France in recent years. These include historical droughts, a topic which was addressed in a 2020 special issue of *Regional Environmental Change* edited by Nicolas Maughan et al. Alexis Metzger and Nicolas Jacob-Rousseau (2020) examined the 1857–1858 drought in Alsace. The authors combined narrative texts, such as letters and reports from municipal officials,

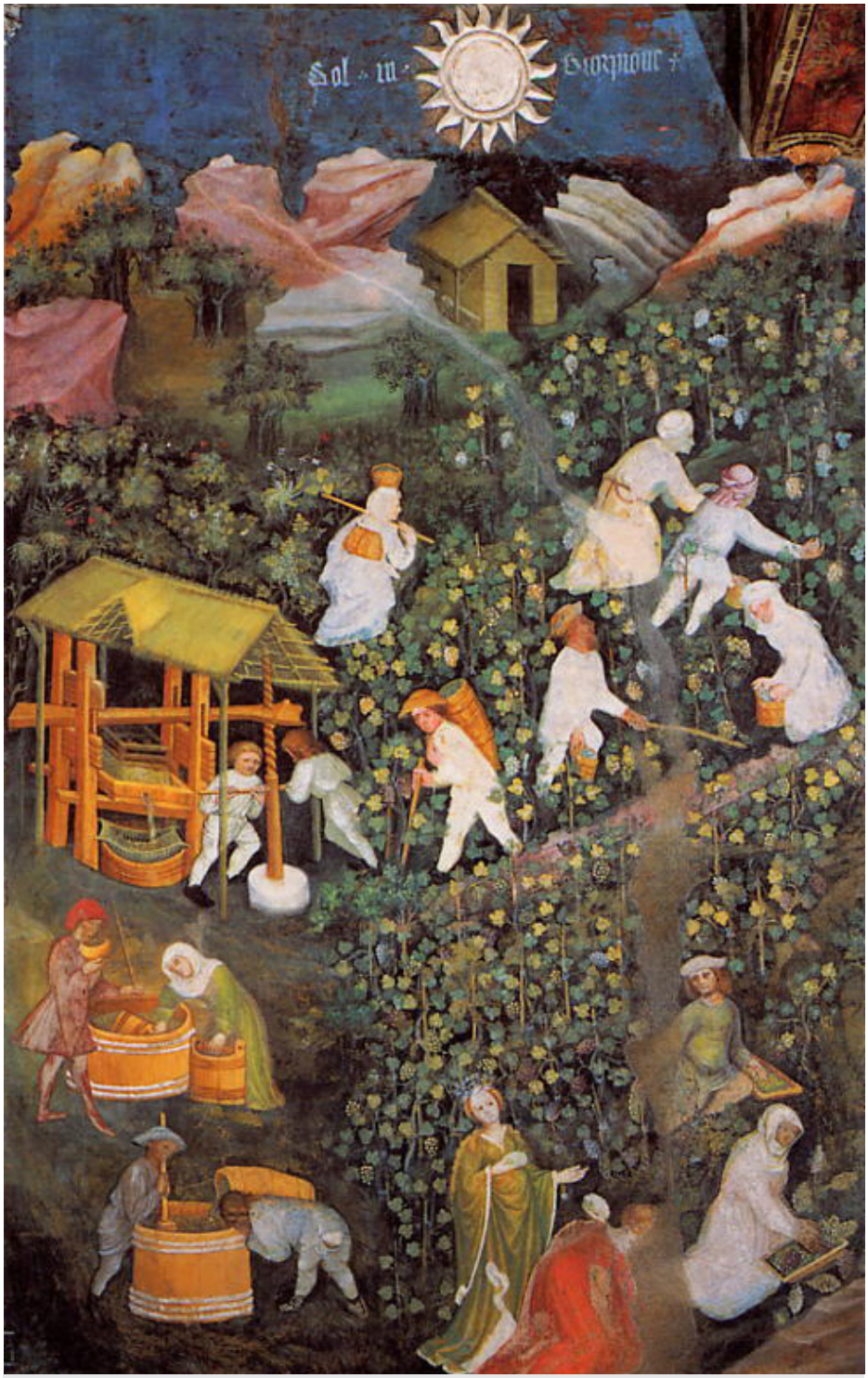


**Figure 1:** Grape harvest in Northern Italy in October, by Maestro Vencelsao. This fresco, painted around 1400, is located in the Eagle Tower of the Buonconsiglio Castle in Trento, Italy.
Source: https://commons.wikimedia.org/w/index.php?curid=6435756

 

farmers, and industries, with instrumental data derived from local rainfall stations. In Emmanuel Garnier's (2019) comparative analysis of droughts over the past 500 years from the Île-de-France, the UK, and the Upper Rhine Valley, documentary data form the backbone of the earlier part of the reconstruction. Garnier mainly uses diaries and municipal chronicles, but he stressed that historians must include all kinds of sources in their analysis. Garnier also recently reconstructed French floods and storms for case studies (Garnier et al. 2018).

**The Benelux countries**

One of the most comprehensive reconstructions of the last two millennia concerns the climate in Belgium and neighboring regions, with the first of several volumes published in Dutch in 1995 by Jan Buisman. The numerous and varied documentary data used for this reconstruction range from a large number of narrative sources to climate proxies and early instrumental measurements. Aryan van Engelen has transformed the text collection into semi-annual climate indices.

A number of reconstructions with a narrower focus have also been published in recent years, including a seasonal temperature and precipitation reconstruction of the 15th century by Chantal Camenisch (2015), which is based mainly on narrative sources and uses climate indices. Adriaan de Kraker (2017) applied a different approach for a reconstruction of the ice cover on Belgian canals in the period from 1330 to 1800. The author analyzed the costs for the laborers who removed the ice to enable shipping traffic on the canals, which were duly recorded in the city accounts. Alexis Metzger and Martine Tabeaud (2017) focused on winter weather conditions in a weather diary of Friesland. They analyzed temperatures and severity by comparing the duration of the wintry weather from 1594 to 1612, and by counting days of frost, rain, or snowfall in the same period.

**The British Isles**

Historical climatologists have also published reconstructions covering the British Isles in recent years. Kathleen Pribyl (2017) reconstructed temperatures and precipitation in Norfolk from 1256 to 1448 by analyzing grain harvest dates in medieval account books and other documentary data. Pribyl calibrated the medieval grain harvest dates with harvest dates from the 18th and 19th centuries, and with measured temperature and precipitation series. Two papers on droughts and their impact on society based on historical precipitation records from areas of the British Isles (Harvey-Fishenden et al. 2019; Murphy et al. 2020) are available, and a database called TEMPEST, on extreme weather events in the UK, is currently in progress (e.g. Veale et al. 2017).

**Scandinavia and the Baltic states**

The Nordic and Baltic states have a long tradition of employing ice phenological observations, such as the dates of freezing and ice breakup in harbors, rivers, and lakes. Such studies have used ice data from the ports of Stockholm, Tallinn, and Riga (Fig. 2), in addition to various stations from the German Baltic coast, although all of these studies were published prior to 2015. A recent addition to the historical ice-breakup observations from the region is a series (1749–2018) from Aura River in Turku, southwest Finland (Norrgård and Helama 2019). This series, like the earlier ice-breakup data, demonstrates strong correlation between the breakup dates and late-winter/spring temperatures. Besides temperature-sensitive written source materials, Dag Retsö and Lotta Leijonhufvud (2020) have compiled a dataset on Swedish historical droughts (1400–1800) from various documentary evidence.


**Figure 2:** Riga and its harbor, by Adam Olearius, 1727. This map is one of the objects being investigated to provide new insights into past climate. ETH-Bibliothek Zürich, Alte und Seltene Drucke. Source: https://doi.org/10.7890/ethz-a-000501220

**Evaluation of the sources and methods**

During the past years, historical climatologists in Western and Northern Europe have examined a large variety of documentary sources. Where available, notes of early instrumental measurement and weather diaries provide very detailed information useful for the calibration of other series. As several examples show, newspapers are also rich sources of data for historical climatology. For the period prior to these measurements, narrative sources, as well as account books and minutes of official and municipal institutions, provide a plethora of data for climate reconstructions. Such sources contain weather-related descriptions or plant or ice phenological information that can serve as proxies for climate variables. The examples of grape harvest dates in Beaune and canal freezing dates in the Netherlands and Belgium demonstrate the potential of such sources. Depending on the types of information derived from the documentary data, studies may either create indices or directly reconstruct meteorological conditions by applying calibration and verification processes.

AFFILIATIONS

[1]Oeschger Centre for Climate Change Research and Institute of History, Section of Economic, Social and Environmental History, University of Bern, Switzerland
[2]Pythéas Institute - Earth sciences and astronomy observatory, Foundation A*MIDEX, Aix-Marseille University, France

CONTACT

Chantal Camenisch: chantal.camenisch@hist.unibe.ch

REFERENCES

Buisman J (1995) Duizend jaar weer, wind en water in de Lage Landen, Deel 1: Tot 1300. Uitgeverij Van Wijnen, 656 pp

Camenisch C (2015) Clim Past 11: 1049-1066

de Kraker AMJ (2017) Water Hist 9: 109-128

Garnier E (2019) In: Iglesias A et al. (Eds) Drought: Science and Policy. John Wiley & Sons Ltd, 45-67

Garnier E et al. (2018) Coastal Eng 134: 10-23

Harvey-Fishenden A et al. (2019) Reg Environ Change 19: 2325-2337

Labbé T et al. (2019) Clim Past 15: 1485-1501

Litzenburger L (2015) Une ville face au climat : Metz à la fin du Moyen Âge, 1400-1530. Éditions Universitaires de Lorraine, 487 pp

Maughan N et al. (Eds) (2020) Reg Environ Change: topical collection

Metzger A, Jacob-Rousseau N (2020) Reg Environ Change 20: 48

Metzger A, Tabeaud M (2017) Clim Change 141: 331-345

Murphy C et al. (2020) Int J Climatol, doi:10.1002/joc.6521

Norrgård S, Helama S (2019) Holocene 29: 953-963

Pichard G, Roucaute É (2014) Méditerranée: special issue

Pribyl K (2017) Farming, Famine and Plague: The impact of climate in Late Medieval England. Springer, 307 pp

Retsö D, Leijonhufvud L (2020) Clim Past Discuss, doi:10.5194/cp-2020-25

Veale L et al. (2017) Geo 4: e0039

# CONTENTS




PAGES
PAST GLOBAL CHANGES

**PAGES International Project Office**
Hochschulstrasse 4
CH-3012 Bern
Switzerland

**Telephone** +41 31 631 56 11
**Email** pages@pages.unibe.ch
**Website** pastglobalchanges.org
**Twitter** @PAGES_IPO
**Facebook** PastGlobalChanges

**Subscribe to PAGES magazine at**
pastglobalchanges.org/products/pages-magazine

**Series Editors**
Sarah Eggleston and Marie-France Loutre

**Guest Editors**
Chantal Camenisch, Sam White, Qing Pei, Heli Huhtamaa

**Text Editing**
Angela Wade

**Layout**
Sarah Eggleston

**Design**
sujata design

**Parent program**
PAGES is a Global Research Project of Future Earth.

**Supporters**
The PAGES International Project Office and its publications are supported by the Swiss Academy of Sciences (SCNAT) and the Chinese Academy of Sciences (CAS).





**Printed on recycled paper by**
Läderach AG
Bern, Switzerland

**Hardcopy circulation** 2100

**ISSN** 2411-605X / 2411-9180

doi.org/10.22498/pages.28.2